EXTRACTING BEST SET OF FACTORS THAT AFFECT STUDENTS ADOPTION OF SMARTPHONE FOR UNIVERSITY EDUCATION: EMPIRICAL EVIDENCE FROM UTAUT-2 MODEL

Mazharuddin Syed Ahmed, John Everatt and Wendy Fox-Turnbull
University of Canterbury, New Zealand

ISSN: 2521-7054

Received 11 April 2017
Revised 12 June 2017
Accepted 24 June 2017

Torain Publishing Limited

Corresponding authors:
Mazharuddin.SyedAhmed@ara.ac

Abstract

Technology acceptance models are used in studies aimed at predicting and explaining the user's behaviors towards the acceptance and usage of new technologies. This paper reports the findings from a doctoral research which focused on analyzing the acceptance of smartphones as learning tools between the two contexts of the study: the College of Engineering (CX1) and the College of Education (CX2) at the University of Canterbury, New Zealand. This study was guided by the Unified Theory of Acceptance and Use of Technology (UTAUT2) model. The survey questionnaire targeted 310 respondents selected through opportunity sampling after distributing 1170 survey questionnaires. This reseach attempts to validate eh survey instrument using data analysis using Exploratory Factor Analysis (EFA). This technique can better articulate intercorrelated variables together with more accuracy and adopts stringent model fit assessment and validation. This study adopted a five step factor extraction method using EFA in finding the best set of variables that explain the adoption of the smartphone as a learning tool.

Introduction

The Smartphone has become a daily necessity for most of us. It is almost an extension of our body and many of our daily activities are dependent on it. The impact of smartphones in our lives can be assessed by the global smartphone market. It has witnessed an extraordinary growth in recent years, with shipments rising by 40 percent in 2013 to exceed the 1 billion units threshold (Linovo, 2014). This report "Insight" forecasts smartphone connections of 2 billion units by 2018 mostly lead by the two giant brand names Apple and Samsung. The explosive growth has been accompanied by significant

disruption to the PC and Web-based computing ecosystems. The services which were formerly only provided on computers have gradually been made available to Smartphones (Shin et al., 2011). From entertainment, communication, playing games, purchasing, photography, watching movies to computing, the Smartphone provides facilities that make it a multifaceted Swiss knife in digital technology.

Most of the popular functions of Smartphones are usually the applications for entertainment and commerce (Lin et al., 2011). On the contrary the power of the smartphone as a computing, collaborating learning and content creating tool in the pockets of students, is seldom realized. The student ownership of these multipurpose mobile devices is growing exponentially (Dixit et al., 2011). It is important, therefore, for educators to understand the potential of these devices for teaching and learning, especially if their use by students is likely to erode constraints that currently deter effective learner engagement with the curriculum (Ali Yaslam Almatari, 2010). The main aim of this research is to find factors that affect the adoption of smartphones in university education. In this context, this research will compare the two groups i.e. College of Engineering (CX1) and College of Education (CX2) from one university cohort. They are chosen according to the contrasting differences in their programs, curriculum, pedagogy, student aptitudes, required skills, and length of study, to name a few. The comparative analysis of these two contexts should give an understanding of the parameters that drive the acceptance of smartphones in a university setting. Given that mobile learning is highly flexible, findings should be applicable across a range of similar context programs.

Unified Theory of Acceptance and Use of Technology (UTAUT 1 and 2)

Venkatesh et al. (2003) proposed the Unified Theory of Acceptance and Use of Technology (UTAUT1) model. A review of prior studies conducted by this research provided a theoretical basis for this formulation. The eight Information Systems (IS) theories and models, which make up UTAUT1, are a combination of constructs and moderators, comprising of the Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM) and TAM2, Motivational model (MM), Theory of Planned behavior (TPB), Model Of PC Utilization (MPCU), Innovation Diffusion Theory (IDT), and Social Cognitive Theory (SCT) (Pitchayadejanant, 2011). Originally, UTAUT1 had four main constructs namely Performance Expectancy (PE), Social Influence (SI), Effort Expectancy (EE) and Facilitating Conditions (FC) which influence behavioral intention to use a technology and usage behaviors. Further, these four constructs were believed to be moderated by gender, age, experience and Voluntariness of Use in the UTAUT1 model.

The same study conducted an empirical research using data from four organizations in order to integrate all the models. The results report that all the determinants of the model are significant and predictable towards behavioral intention and its subsequent use of the technology in question. Venkatesh et al. (2012) made some modifications in the UTAUT1 model based on their findings from a research conducted in Hong Kong and presented three additional constructs to UTAUT1 model. The first construct is Hedonic Motivation (HM: intrinsic motivation). The second is Price (PR) and finally, the third construct is Habit (HA). Venkatesh et al. (2012) claimed the suggested additions in UTAUT2 exhibit significant changes in the variance explained in behavioral intention and technology use.

Finally, Venkatesh et al. (2012) synthesize all the findings and created the UTAUT2 model with 9 core constructs. The 9 key constructs that influence intention to use a technology are Performance Expectancy (PE: the expected degree to which using a technology could improve performance), Effort Expectancy (EE: the degree of ease associated with the use of technology), Social Influence (SI: the extent to which the user perceives that he should use

technology), and Facilitating Conditions (FC: which refer to resources and support available to use technology). Hedonic Motivation (HM: fun or pleasure derived from using technology), Price Value (PR: cognitive trade-off between perceived benefits of using technology and the costs for using them), and Habit (HB: the extent to which the user believes technology use is automatic). Furthermore, the principal underpinning of the UTAUT model posits that Behavioral Intention (BI) will decide the Use Behavior (UB) of any technology adoption, as according to the theory of Planned Behaviour (Ajzen, 1991)

Research Methodology

This study aims to find the best set items from each latent factors that best explain the students intention (between the two context CX1 and CX2) to use the smartphone as a learning tool in a university context using UTAUT2 model. We adopted a five step factor extraction method as illustrated in figure 1.0, next page. Further, we will not test the relationship between behavior intention, facilitating conditions and habits against use behavior as we are looking explicitly at the intention (as hypothesized by the UTAUT2 model) to adopt the smartphone by university students. In order to find the right set of parameters, the five step Exploratory Factor Analysis (EFA) model was carried out in the IBM SPSS 20 software.

Step-1: Derive research hypothesis (Descriptive Statistics')

Step-2: Sample size, data collection, missing values and data reliability

Step-3: Assessing data readiness check for EFA

Step-4: Confirming the initial factors set conferring to Eigenvalue rule criteria

Step-5: Extracting factors based on Maximum Likelihood factor rotation method

Step-1: Derive research hypothesis

This research postulates seven constructs of the UTAUT1 model (Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Hedonic Motivation, Price and Habit) that influence behavioral intention more positively in CX1 than CX2 (see figure 1.0). These seven independent variables are hypothesized to be the determinants of accepting smartphones as learning tools, with behavioral intention (BI) counted as a dependent variable. Further, the CX1 students are expected to respond to the smartphone acceptance more positively than CX2. By its very nature, an engineering education challenges students with aptitudes for technology based activities and learning. They routinely interact with technology, input data, design engineering projects, concepts and solve problems using digital technology. The hypotheses of this research are listed below:

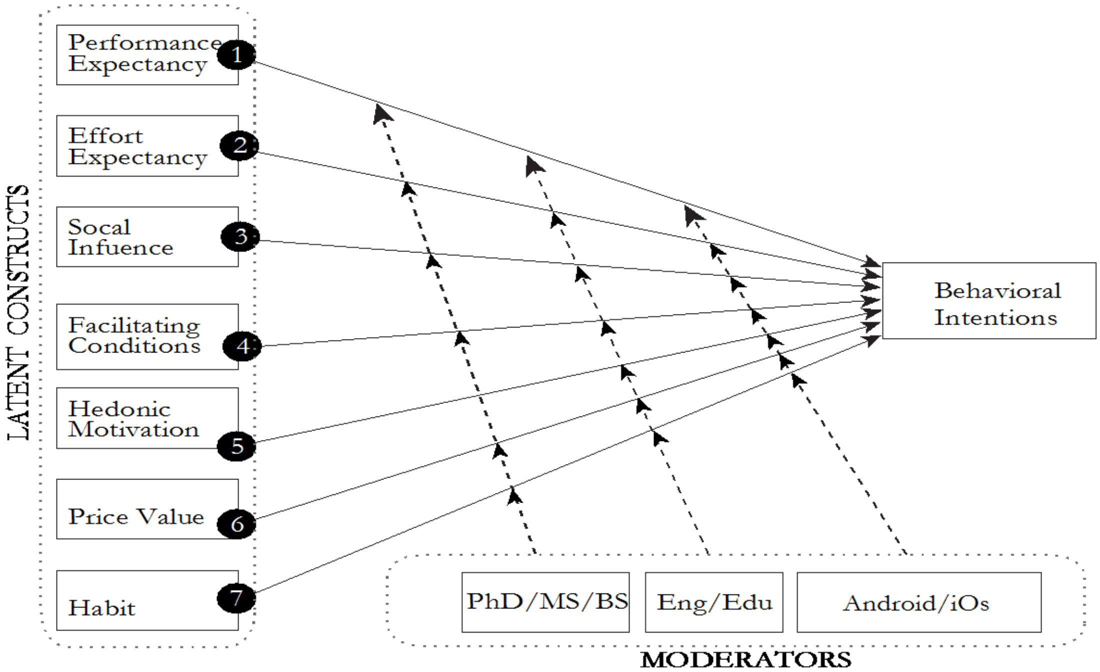

Figure 1: UTAUT2 Model hypothesizing seven latent constructs influencing behavior intension to use a technology (Venkatesh et. al., 2003)

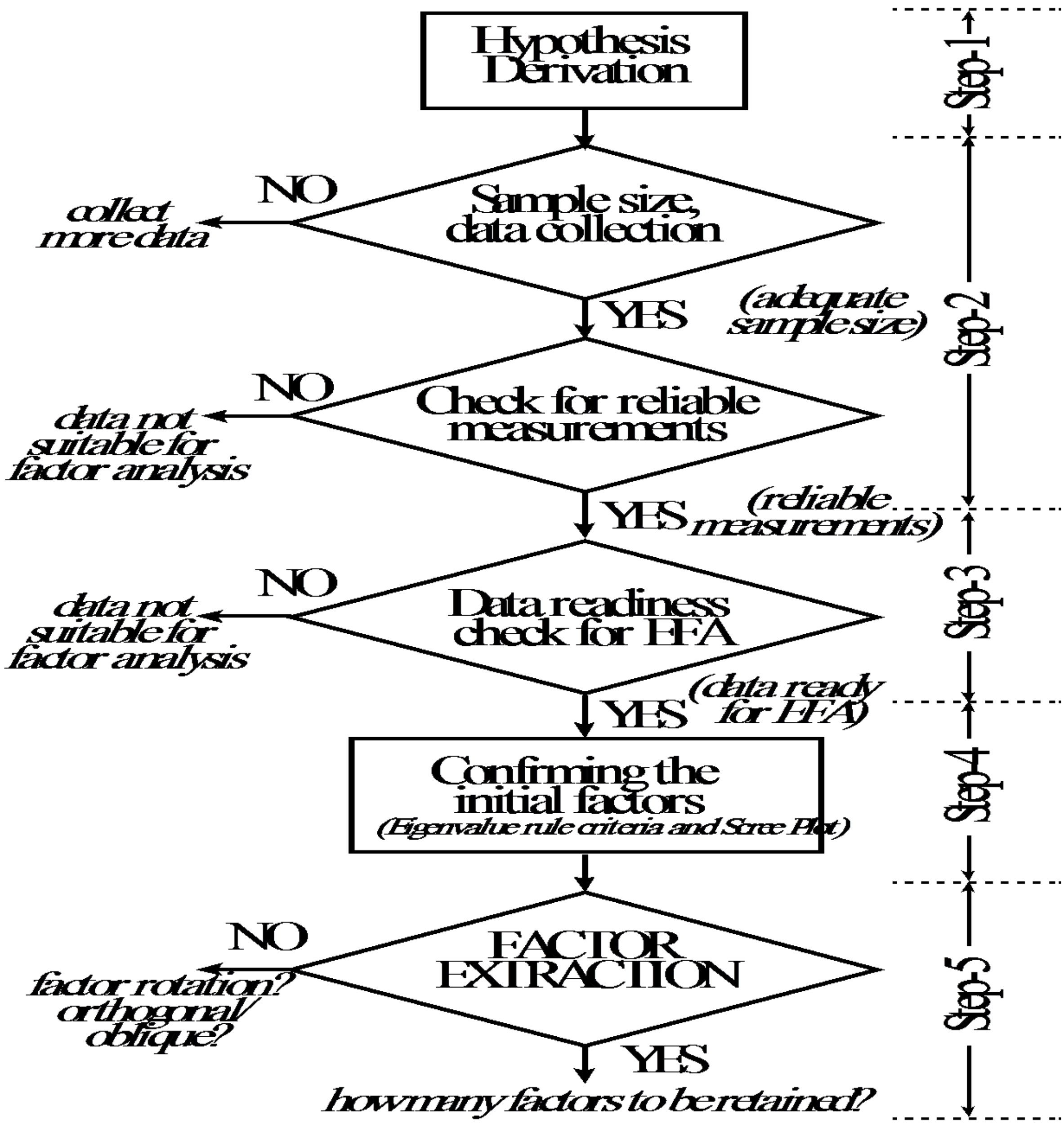

Figure 2: Research methodology factor extraction flowchart

H1: Performance expectancy will have positive influence on behavior intention more with context-1 than context-2
H2: Effort expectancy will have positive influence behavior intention more with context-1 than context-2
H3: Social influence will have positive influence on behavior intention more with context-1 than context-2
H4: Facilitating condition will have positive influence on behavior intention with context-1 than context-2
H5: Hedonic Motivation will have more positive influence behavior intention more with context-1 than context-2
H6: Price Value will have more positive influence behavior intention with context-1 than context-2
H7: Habit will have more positive influence behavior intention with context-1 than context-2

Subjects and Procedures: Participants of this study were students from the Faculty of Engineering (133) and Educational Studies (166), University Canterbury as illustrated in table 1.0. Instrumentation: The questionnaire comprised of two parts. Part-1 focused on collecting demographic and smartphone usage data and part-2 consisted of 62 items on a 5-point Likert scale with 1 representing "strongly disagree" and 5 representing "strongly agree". These items were adapted from various published sources(Chesney, 2006; Jairak et al., 2009; Nassuora, 2012; Slade et al., 2013; Sundaravej, 2010; Williams et al., 2012). Our measurement scale composes items (see Table 1.0) of seven independent variables, PE, EE, SI and FC, and of another dependent variable, the Behavioral Intention to Use. Five-point Likert Scales ranging from "Strongly Disagree" to "Strongly Agree" are employed for responses to all these items. In accordance with the usual method, we analyze the reliability, validity, covariance and fit indices, and then verify the hypotheses.

Step-2: Sample size, data collection, missing values and data reliability for EFA

Factor analysis originated in the early 1900's with Charles Spearman's enlargement of the Two-Factor Theory which lead to an expanding of work on the theories and mathematical principles of factor analysis (Ekstrom et al., 1976). Factor analysis consumes mathematical techniques which iterate to simplify the measures which are interrelated and formulates patterns as variables set from a large sets of data (Child, 2006). In the terminology of factor analysis, any effort to discover the simplest method of variables interpretation is known as parsimony. Today EFA is widely used in big data analytics such as market research, consumer assessment, modeling of epidemics, behavioural science, social sciences, medicine, economics, and geography.

Sample size: The next important phase in this step is the assessment of the sample size. This depends on two criteria: the ratio of the number of variables to the number of factors, and the number of the factors to be extracted. In general, over 300 cases are considered adequate for analysis (Field, 2013). This should be taken into consideration, as it can seriously influence the reliability of the extracted factors. Factor analysis is a technique that requires a large sample size. (Tabachnick et al., 2001) cite Comrey and Lee's (1992) advice regarding sample size: 50 cases are very poor, 100 is poor, 200 is fair, 300 is good. The number of sample subjects was set at 300 after considering many research papers and literature reviews of factor analysis as well as the number of parameter estimates; the number of sample subjects was set at 300.

Data collection: Based on UTAUT2 model, data was collected in a 6-month period and the study distributed a total number of 1150 questionnaires towards the two contexts of the study (CX1 and CX2) of the university and received 311 feedbacks. Approximately 99 % of the investigations are answered in paper, and 1 % online. The students were well instructed and informed about the scope of the study before taking the survey. A total of 12 questionnaires were invalidated owing to incomplete/inconsistent submission. A details description of the data sample and descriptive information is illustrated in table 1.0.

Data reliability: Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. It is considered to be a measure of scale reliability. To assess reliability of the data, Cronbach's Alpha was evaluated. All value-indicators mentioned on Tables 2.0 were well above the prescribed 0.7 as excellent. According to (Henseler et al., 2009) Cronbach's Alpha should have values higher than 0.7 Alpha based on the correlations of indicators.

Table 1: Descriptive analysis of the study sample

No	Description	Engineering		Education	
1	**Gender**	Frequency	%	Frequency	%
	Female	30	23%	111	67%
	Male	103	77%	55	33%
2	**Education level**				
	UG (Under Graduate)	91	68%	126	76%
	MS (Masters/Post Graduate)	19	14%	16	10%
	PhD	23	17%	24	14%
3	**Smartphone Ownership**				
	None	3	2%	7	3%
	Smartphone	102	73%	114	70%
	Smartphone and Tablet	23	25%	44	27%
4	**Smartphone Operating System**				
	Android	80	60%	76	46%
	iOS (Apple Operating System)	48	36%	84	51%
	Other	4	4%	2	3%
5	**Skill Level**				
	Limited User	9	8%	16	10%
	Good User	84	63%	119	72%
	Expert User	39	29%	28	18%

Table 2: Reliability measurement of reflective variables (n =299)

Measurement Item	Code	Mean	Std. Deviation	Cronbach's A
Effort Expectancy	EE	4.118	0.933	0.82
Social Influence	SI	3.591	0.934	0.92
Facilitating Condition	FC	4.524	0.930	0.90
Hedonic Motivation	HD	3.788	0.951	0.92
Price	PR	3.946	0.942	0.85
Habit	HB	3.498	0.905	0.79
Behaviour Intention	BI	4.001	0.945	0.88

Step 3: Assessing data readiness check for EFA:

Prior to the extraction of the factors, several tests should be used to assess the suitability of the respondent data for factor analysis (Williams et al., 2012). This step also checks for sample size, adequacy test, missing values, consistency and errors in collected data. The tests which include testing the suitability of data for factor analysis are Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity (M.-Y. Wu et al., 2012; Y.-L. Wu et al., 2008). The KMO index ranges from 0 to 1, with 0.50 considered suitable for factor analysis. The Bartlett's Test of Sphericity should be significant ($p<.05$) for factor analysis to be suitable (Yu, 2012). This research showed both the test results well in

the acceptable limits to be deemed satisfactory for sample size, adequacy test as shown in table 3.0.

Table 3: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.935**
Bartlett's Test of Sphericity	Approx. Chi-Square	5308.810
	df	435
	Sig.	.000

Step-4: **Confirming the initial factors set conferring to Eigenvalue rule criteria**

The fourth step of EFA confirms the extracted set factors conferring empirically to the eigenvalue rule along with the Scree Plot cross graphical confirmation. The data collected displayed 61% cumulative percentage of variance explained by a total of 7 components (factors) having an eigenvalue > 1. This confirmed the seven constructs of UTAUT2 model used by this research as illustrated in table 4.0. According to (Kaiser, 1960) the requirement that the eigenvalue be greater than 1 was followed, and the factor load lower cut-off point was set at 0.50 for each item, as also suggested by (Hair et al., 2012; Weiwei SHI, 2007; Williams et al., 2012).

Furthermore, the graphical interpretation using the Scree Plot determines the number of factors extracted by drawing a straight line through the smaller eigenvalues where a departure from this line occurs as shown in the figure 2.0. This point highlights where the debris or break occurs. In the example below (see Figure 2), the inspection of the Scree plot and eigenvalues produced a parting line from linearity coinciding with a 7-factor result. Therefore this “Scree Test” indicates that the data should be analysed for 7 factors. The mean values of all the items ranged from 3.498 to 4.52. Standard deviations ranged from 0.90 to 0.94 respectively.

Step-5: **Extracting factors based on Maximum Likelihood factor rotation method**

The aim of the fifth data extraction step is to reduce a large number of items into factors. This factor extraction procedure was based on the combination of using Maximum Likelihood rotation method and Promax rotation technique. This step primarily eliminates variables which do not load on any factor, or variables that loaded on multiple factors, or variables which load lower than 0.40. A total of 37 variables from the initial set of 62 did not meet with the above mentioned criteria and were eliminated at this screening level. The variables of performance Expectancy (PE) and Behavior Intension were loaded together and hence will be considered as one set of variables as Behavior Intention - according to (Costello et al., 2011). Finally seven constructs of UTAUT2 model loaded only on one factor each. Hence these seven factor set can be used to assess for Confirmatory Factor Analysis (CFA).

Table 4: Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	17.176	44.042	44.042	16.701	42.822	42.822	14.410
2	2.682	6.878	50.920	2.294	5.882	48.705	8.895
3	1.747	4.480	55.400	1.303	3.342	52.047	12.384
4	1.472	3.775	59.175	1.208	3.096	55.143	12.565
5	1.243	3.186	62.361	.828	2.122	57.265	8.275
6	1.083	2.776	65.138	.903	2.317	59.582	8.531
7	1.042	2.672	67.810	.628	1.611	**61.193**	4.563
8	.830	2.127	69.938				
9	.817	2.096	72.034				
10	.737	1.889	73.923				
11	.689	1.765	75.688				
12	.630	1.617	77.305				
13	.604	1.549	78.854				
14	.571	1.464	80.318				
15	.550	1.410	81.728				
16	.514	1.319	83.047				
17	.499	1.279	84.326				
18	.451	1.156	85.482				
19	.425	1.089	86.570				
20	.400	1.025	87.596				
21	.379	.972	88.568				
22	.367	.942	89.510				
23	.353	.906	90.416				
24	.347	.889	91.305				
25	.332	.852	92.157				
26	.317	.813	92.970				
27	.290	.744	93.714				
28	.287	.735	94.449				
29	.271	.695	95.144				
30	.249	.638	95.782				
31	.244	.625	96.407				
32	.236	.604	97.011				
33	.222	.569	97.580				
34	.193	.496	98.075				
35	.183	.469	98.545				
36	.165	.424	98.969				
37	.159	.409	99.377				
38	.131	.336	99.713				
39	.112	.287	100.000				

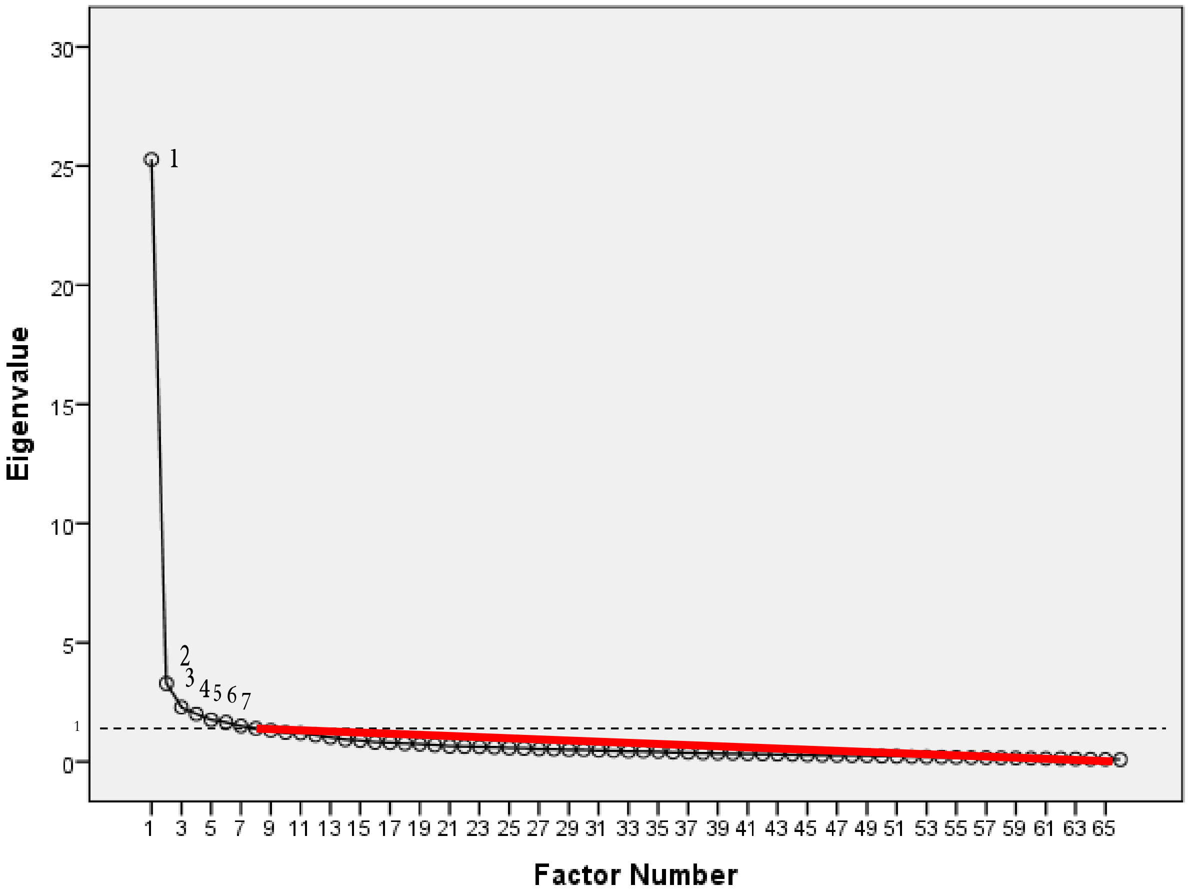

Figure 3: Scree Plot displaying the eigenvalues associated with 7 factors above value 1.0

Discussions and Conclusions

In this paper an example is given of the use of factor analysis to compare the sets of parameters with two different context of the same university and to assess the factors which affect the use of smartphone for education. All the extracted latent factors best set of items are again tested for their reliability and results clearly indicate high alpha values. This proves that all the EFA extracted items are highly reliable, dependable and are expected to yield superior results if used for hypothesis testing, multivariate regression or Structural Equation Modeling path analysis.

Table 5: Final Pattern Matrix (25 Variables Extracted)

	Factors						
	1	**2**	**3**	**4**	**5**	**6**	**7**
FC12	.844						
FC13	.763						
FC16	.695						
FC17	.617						
FC11	.528						
HD03		.902					
HD06		.860					
HD01		.728					
HD05		.677					
PR01			.928				
PR03			.905				
PR04			.740				
PR02			.360				
SI02				.831			
SI07				.756			
SI03				.610			
EE04					.744		
EE02					.686		
EE03					.635		
HB02						.846	
HB04						.539	
HB03						.382	
BI01							.842
BI02							.549
BI03							.408

Extraction Method: Maximum Likelihood.
Rotation Method: Promax with Kaiser Normalization.
a. Rotation converged in 7 iterations.

As explained earlier, the methodology adopted in the exploratory factor extraction using Maximum Likelihood has been carried out with Promax Rotation method. This resulted into extracting seven factors which explicate more than 60% of the variance explained. EFA can be a complex exercise and many researchers in this course often adopt the rule of the thumb or heuristics in their approach to extracting factors. But these do not render precise results. Using the EFA should involve a sequence of well-constructed steps and a multivariate approach.

Table 6: Extracted items descriptive statistics and Cronbach's Alpha Values

Latent Constructs	Items	Mean	Std. Deviation	Cronbach's Alpha if Item Deleted
Facilitating Condition (SC)	FC12	3.70	.970	.940
	FC13	3.54	1.037	.941
	FC16	3.87	1.018	.942
	FC17	3.81	.876	.941
	FC11	3.39	1.048	.940
Hedonic Motivation (HM)	HD03	3.25	1.047	.938
	HD06	3.28	1.017	.938
	HD01	3.42	.998	.939
	HD05	3.13	1.092	.938
Price (PR)	PR01	3.39	1.029	.940
	PR03	3.42	1.041	.940
	PR04	3.41	1.043	.940
	PR02	3.65	.949	.940
Social Influence (SI)	SI02	3.02	.948	.939
	SI07	2.89	.991	.940
	SI03	2.79	.940	.940
Effort Expectancy (EE)	EE04	3.20	1.117	.940
	EE02	3.49	1.001	.939
	EE03	3.69	.904	.941
Habit (HA)	HB02	2.31	1.141	.940
	HB04	3.16	1.371	.943
	HB03	2.77	1.208	.939
Behaviour Intention (BI)	BI01	3.39	1.116	.939
	BI02	3.09	1.121	.939
	BI03	3.45	1.053	.938

The steps cited in this research to conduct EFA are intricate statistical procedures involving many sequential steps. As stated earlier, the main aim of this research was to extract the best set of factors that best represent the acceptance of the smartphone for university education between the two contexts of the study. The extracted factors can further be tested for Confirmatory Factor Analysis (CFA). CFA often includes assessing a 'model fit' to check the model accuracy and consistency, multivariate regression analysis for hypothesis testing.

Reference

Ajzen, Icek. (1991). The theory of planned behavior. Organizational behavior and human decision processes, 50(2), 179-211.

Ali Yaslam Almatari, Noorminshah A.Iahad and Ali Saleh Balaid. (2010). Factors Influencing Students' Intention to Use M-learning. Journal Of Information Systems Research And Innovation.

Chesney, Thomas. (2006). An acceptance model for useful and fun information systems. Human Technology: An Interdisciplinary Journal on Humans in ICT Environments, 2(2), 225-235.

Child, Dennis. (2006). The essentials of factor analysis: A&C Black.

Costello, AB, & Osborne, JW. (2011). Best practices in exploratory factor analysis: four recommendations for getting the most from your analysis. Pract Assess Res Eval 2005; 10. pareonline. net/getvn. asp, 10, 7.

Dixit, Sudhir, Ojanpera, Tero, van Nee, Richard, & Prasad, Ramjee. (2011). Introduction to globalization of mobile and wireless communications: Today and in 2020 Globalization of Mobile and Wireless Communications (pp. 1-8): Springer.

Ekstrom, Ruth B, French, John W, Harman, Harry H, & Dermen, Diran. (1976). Manual for kit of factor referenced cognitive tests: Educational Testing Service.

Field, Andy. (2013). Discovering statistics using IBM SPSS statistics: Sage.

Hair, Joseph F, Sarstedt, Marko, Pieper, Torsten M, & Ringle, Christian M. (2012). The use of partial least squares structural equation modeling in strategic management research: a review of past practices and recommendations for future applications. Long range planning, 45(5), 320-340.

Henseler, Jorg, Ringle, Christian M, & Sinkovics, Rudolf R. (2009). The use of Partial Least Squares Path Modeling in International Marketing.

Jairak, Kallaya, Praneetpolgrang, Prasong, & Mekhabunchakij, Kittima. (2009). An acceptance of mobile learning for higher education students in Thailand. Paper presented at the Sixth International Conference on eLearning for Knowledge-Based Society, Thailand.

Kaiser, Henry F. (1960). The application of electronic computers to factor analysis. Educational and psychological measurement.

Lin, Song, Lin, Sally, & Huang, Xiong. (2011). Advances in Computer Science, Environment, Ecoinformatics, and Education, Part IV: International Conference, CSEE 2011, Wuhan, China, August 21-22, 2011. Proceedings (Vol. 217): Springer Science & Business Media.

Linovo. (2014). Global Smartphone Market Analysis and Outlook: Disruption in a Changing Market.

Nassuora, Ayman Bassam. (2012). Students acceptance of mobile learning for higher education in Saudi Arabia. American Academic & Scholarly Research Journal, 4(2), 24-30.

Pitchayadejanant, Krittipat. (2011). Intention To Use Of Smart Phone In Bangkok Extended Utaut Model By Perceived Value. Paper presented at the International Conference on Management (ICM 2011) Proceeding. Conference Master Resources.

Shin, Dong-Hee, Shin, Youn-Joo, Choo, Hyunseung, & Beom, Khisu. (2011). Smartphones as smart pedagogical tools: Implications for smartphones as u-learning devices. Computers in Human Behavior, 27(6), 2207-2214.

Slade, Emma, Williams, Michael, & Dwivdei, Yogesh. (2013). Extending UTAUT2 To Explore Consumer Adoption Of Mobile Payments. Paper presented at the Proceedings of the UK Academy for Information Systems Conference, March.

Sundaravej, Thanaporn. (2010). Empirical validation of unified theory of acceptance and use of technology model. Journal of Global Information Technology Management, 13(1), 5-27.

Tabachnick, Barbara G, & Fidell, Linda S. (2001). Using multivariate statistics.

Venkatesh, Viswanath, Morris, Michael G, Davis, Gordon B, & Davis, Fred D. (2003). User acceptance of information technology: Toward a unified view. MIS quarterly, 425-478.

Venkatesh, Viswanath, Thong, James YL, & Xu, Xin. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. MIS quarterly, 36(1), 157-178.

Weiwei SHI, Dong CHENG. (2007). An Empirical Research on Infomediaries Based on Unified Theory of Acceptance and Use of Technology (UTAUT).

Williams, Brett, Brown, Ted, & Onsman, Andrys. (2012). Exploratory factor analysis: A five-step guide for novices. Australasian Journal of Paramedicine, 8(3), 1.

Wu, Mei-Ying, Yu, Pei-Yuan, & Weng, Yung-Chien. (2012). A Study on User Behavior for I Pass by UTAUT: Using Taiwan's MRT as an Example. Asia Pacific Management Review, 17(1), 92-111.

Wu, Yu-Lung, Tao, Yu-Hui, & Yang, Pei-Chi. (2008). The use of unified theory of acceptance and use of technology to confer the behavioral model of 3G mobile telecommunication users. Journal of Statistics and Management Systems, 11(5), 919-949.

Yu, Chian-Son. (2012). Factors affecting individuals to adopt mobile banking: Empirical evidence from the UTAUT model. Journal of Electronic Commerce Research, 13(2), 104-121.